REMARKS

I. Claim Status.

Claims 1-19 are currently pending. Claims 1-15, 18 and 19 currently stand rejected. Claims 16 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant respectfully requests reconsideration of the Subject Application in light of the following remarks.

II. Objection to the Specification.

In the pending Office Action, the amendment to the specification filed 8 July 2008 is objected to under 35 U.S.C. §132(a) because it allegedly introduces new matter into the disclosure. Applicant respectfully traverses this objection.

The Subject Application as originally filed states that "[t]his application is a continuation in part of United States Application Serial Number 09/947,846, filed on 06 September 2001" (page 1, lines 11-12). The Subject Application as originally filed additionally refers to "United States Patent Application Number 09/947,846, filed on 06 September 2001, directed to an Electrolysis Cell for Generating Chlorine Dioxide" on page 3, lines 18-20. The Subject Application as originally filed also states that "[a]ll documents cited are, in relevant part, incorporated herein by reference" (page 20, line 32).

The Rules of Practice in Patent Cases (37 C.F.R. § 1.1 *et. seq.*) state that "an incorporation by reference must be set forth in the specification and must (1) [e]xpress a clear intent to incorporate by reference using the root words 'incorporat(e)' and 'reference' (*e.g.*, 'incorporate by reference'); and (2) [c]learly identify the referenced patent, application, or publication." 37 C.F.R. § 1.57(b). Furthermore, the Rules state that "[a]n insertion of material incorporated by reference into the specification or drawings of an application must be by way of an amendment to the specification or drawings. Such an amendment must be accompanied by a

statement that the material being inserted is the material previously incorporated by reference and that the amendment contains no new matter." 37 C.F.R. § 1.57(f).

The amendment to the specification filed 8 July 2008 was proper because the subject matter added in the amendment is clearly disclosed in U.S. Pat. App. No. 09/947,846, which is clearly incorporated by reference into the Subject Application as described above. First, the Subject Application uses the language "incorporated herein by reference," in compliance with 37 C.F.R. § 1.57(b). Second, the Subject Application clearly identifies U.S. Pat. App. No. 09/947,846, which issued as U.S. Pat. No. 7,048,842 on 23 May 2006, in compliance with 37 C.F.R. § 1.57(b). Third, the amendment properly inserted material that is clearly disclosed in U.S. Pat. App. No. 09/947,846 (U.S. Pat. No. 7,048,842) in compliance with 37 C.F.R. § 1.57(f). See U.S. Pat. No. 7,048,842, beginning at column 14, line 21 through column 16, line 27; in particular Examples 1 and 6 and Table C (clearly disclosing the subject matter inserted into the Subject Application by way of the amendment filed 8 July 2008).

Furthermore, in this regard the MPEP expressly sets forth appropriate guidelines:

> Instead of repeating some information contained in another document, an application may attempt to incorporate the content of another document or part thereof by reference to the document in the text of the specification. The information incorporated is as much a part of the application as filed as if the text was repeated in the application, and should be treated as part of the text of the application as filed. Replacing the identified material incorporated by reference with the actual text is not new matter. See >37 CFR 1.57 and< MPEP § 608.01(p) for Office policy regarding incorporation by reference.

MPEP §2163.07(b) (emphasis added). Accordingly, the amendment to the specification filed 8 July 2008 was proper. The material that was inserted in the Subject Application was material previously and properly incorporated by reference in compliance with 37 C.F.R. § 1.57. Thus, the amendment contained no new matter. Therefore, Applicant respectfully requests withdrawal of the objection to the specification under 35 U.S.C. §132(a).

III. Claim Rejections under 35 U.S.C. §112, first paragraph.

In the pending Office Action, claims 1, 9 and 15 are rejected under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement. Specifically, the Office asserts that the claims contain new matter not disclosed in the Subject Application as originally filed. However, as discussed above in Section II, the recitation "wherein the system is structured to consume power at about one Watt or less" is clearly supported by the material incorporated by reference in compliance with 37 C.F.R. 1.57. This material is expressly set forth in the properly amended specification. Thus, claims 1, 9 and 15 as amended pursuant to the amendment filed 8 July 2008 do not contain new matter. Therefore, Applicant respectfully requests withdrawal of the rejection of claims 1, 9 and 15 under 35 U.S.C. §112, first paragraph.

IV. Claim Rejections under 35 U.S.C. § 102(b).

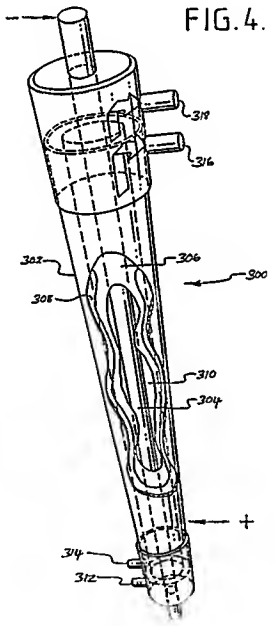
In the pending Office Action, claim 1 is rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,632,347 to Buckley et al. ("Buckley"). Applicant traverses this rejection.

As a preliminary matter, Applicant notes that Buckley published on October 14, 2003 as U.S. Pat. No. 6,632,347. Therefore, Buckley is available as prior art under 35 U.S.C. §102(b) only as of October 14, 2003. However, the Subject Application was filed on September 30, 2003; 14 days before the Section 102(b) prior art date of Buckley. Thus, Buckley is not prior art with respect to the Subject Application. Therefore, Applicant respectfully requests withdrawal of the rejection of claim 1 under 35 U.S.C. §102(b).

Notwithstanding the fact that Buckley is not prior art, the reference nevertheless fails to describe various features recited in the present claims. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference, arranged as required by the claim, and in as complete detail as is

contained in the claim. See MPEP §2131. Claim 1 recites, among other things, "a non-membrane electrolysis cell comprising an anode and a cathode, and having a cell chamber with an inlet for receiving said aqueous feed solution stream comprising said halogen dioxide salt and an outlet for discharging effluent comprising halogen dioxide." Buckley fails to describe a system comprising this feature among others.

Buckley discloses a method of operating an electrolytic cell to produce an output solution having a predetermined level of available free chlorine ("AFC") species including hypochlorous acid and sodium hypochlorite. The electrolytic cell disclosed in Buckley is described beginning at column 24, line 44 through column 25, line 4, and in conjunction with Figure 4.



The "cell 300 comprises co-axially cylindrical and rod electrodes 302, 304 respectively, separated by a semi-permeable ceramic membrane 306 co-axially mounted between the electrodes this splitting the space between the electrodes to form two chambers 308, 310" (Buckley, column 24, lines 45-49, emphasis added). In addition, the reference describes in detail the types of electrolytic cells useable in the disclosed methods (Buckley, column 14, line 20 to column 15, line 20). Every electrolytic cell described in Buckley employs "a semi-permeable or ion-selective membrane."

In direct contrast, however, the present claims recite, among other things, "a non-membrane electrolysis cell." As defined in the specification of the Subject Application, "[a] non-membrane electrolysis cell is an electrolysis cell that comprises an anode electrode and a cathode electrode, and having a cell chamber, and which does not have an ion permeable membrane that divides the cell passage into two (or more) distinct anode and cathode chambers" (specification, page 3, lines 29-32, emphasis added). Indeed, the specification describes various reasons why separate-compartment, membrane-containing electrolysis cell are not used in the systems recited in the present claims (specification, page 3, lines 7-15). However, Buckley expressly describes the importance of using electrolytic cells having separated anode and cathode chambers. For example, Buckley teaches that it is important that the membrane not allow gross mixing of the anolyte and catholyte solutions (column 14, lines 42-47). Thus, Buckley teaches that a membrane is a crucial element, whereas the present claims recite a non-membrane electrolysis cell.

Accordingly, the system described in Buckley and the system recited in the present claims are structurally distinct and different. Indeed, each and every element as set forth in the present claims is not found, either expressly or inherently described, in Buckley, arranged as required by the claims, and in as complete detail as is contained in the claims. Therefore, Applicant respectfully requests withdrawal of the rejection of claim 1 under 35 U.S.C. §102(b).

V. Claim Rejections under 35 U.S.C. § 103(a).

In the pending Office Action, claims 4-5 and 7-8 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Buckley. Claim 2 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Buckley in view of U.S. Patent No. 4,414,070 to Spence ("Spence"). Claims 3, 9-11, 13-15 and 18-19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Buckley in view of U.S. Patent No. 5,106,465 to Kaczur et al. ("Kaczur"). Claims 6 and 12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Buckley in view of Kaczur, and further in view of German Patent No. DE-100,17,407 ("DE-407"). Applicant respectfully

traverses all of the foregoing rejections.

In addition, in the pending Office Action, claim 1 is rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,306,281 to Kelley ("Kelley") in view of Buckley. Claim 2 stands rejected under 35 U.S.C. §103(a) as unpatentable over Kelley in view of Buckley, and further in view of Spence. Claims 3-5 and 7-8 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kelley in view of Buckley, and further in view of Kaczur. Claim 6 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Kelley in view of Buckley and Kaczur, and further in view of DE-407. Claims 9-15 and 18-19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kelley in view of Buckley, Kaczur and DE-407, and further in view of U.S. Patent No. 5,965,004 to Cowley et al. ("Cowley"). Applicant respectfully traverses all of the foregoing rejections.

A. Independent claims 1, 9 and 15.

As discussed above in Section IV, Buckley fails to teach or suggest a non-membrane electrolysis cell. The references cited in combination with Buckley all fail to remedy this deficiency. In fact, Buckley expressly describes the importance of using electrolytic cells having separated anode and cathode chambers. Accordingly, a person having ordinary skill in the art would have no reason to modify Buckley to remove the disclosed separator membranes because such a modification would render the Buckley system inoperative, or at the very least substantially change the principles under which the Buckley system operates.

A proposed modification cannot render a prior invention inoperative (*In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)); and a proposed modification cannot require a substantial reconstruction or redesign of the elements shown in a reference, or change the principles under which a prior system was designed to operate (*In re Ratti*, 270 F.2d 810, 813, 123 USPQ 349, 352 (CCPA 1959)). In other words, if a proposed modification would render a prior invention being modified unsatisfactory for its intended purpose, then there is no rational reason to make the proposed modification. In addition, if a proposed modification or combination of references would change the principle of operation of the invention being

modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. See MPEP §2143.01(VI).

In the present matter, if the electrolytic cell described in Buckley were modified to remove the disclosed separator membrane, then the electrolyte solutions would mix, which would disrupt the pH control and AFC concentrations in the anolyte/output solution. This modification would directly conflict with the disclosed functionality of the Buckley system (Buckley, column 8, lines 18-51 and column 14, line 31 through column 15, line 20). Thus, Buckley – alone or in combination with the other references cited in the Office Action – fails to teach or suggest a non-membrane electrolysis cell. Therefore, Buckley cannot serve as the basis for a *prima facie* case of obviousness with respect to the present claims.

In addition, claims 1, 9 and 15 have been previously amended to recite, among other things, "an electric current supply configured to provide a current through the aqueous feed solution in the passage between the anode and the cathode wherein the system is structured to consume power at about one Watt or less." Applicant submits that Buckley, Kelley and the other cited references all fail to teach or suggest this claim feature.

The Office asserts – without any factual support – that Buckley and Kelley, alone or in combination, are inherently capable of consuming power at about one watt or less. However, this assertion improperly ignores the explicit teachings set forth in the respective references.

Buckley discloses that as "the saline solution flows through the electrolytic cells, a fixed current of between 7-9 amps (typically 8A) is applied to each cell causing electrolysis of the saline solution thereby generating free chlorine in the resulting anolyte . . ." (column 21, lines 31-35). Accordingly, Buckley expressly teaches the application of at least 7 amps of constant current through the disclosed electrolysis cell in order to generate the necessary amounts of AFC. If a constant current of 7 amps is applied to the Buckley cell as disclosed, then in order to achieve a power consumption of 1 watt, the average voltage drop across the cell would have to be 0.143

volts, pursuant to the relationship: Power (watts) = Voltage (volts) x Current (amps).[1] A voltage drop of 0.143 volts would require – pursuant to Ohm's Law – an average ohmic resistance of only 0.020 ohms for the entire electrolytic cell disclosed in Buckley. A person having ordinary skill in the art readily recognizes that an electrolytic cell possesses an average resistance much greater than 0.020 ohms. See, for example, Kelley (discussed below), which implicitly discloses ohmic resistances for electrolysis cells that are orders of magnitude greater than 0.020 ohms.

Accordingly, Buckley does not inherently disclose a system structured to consume power at about one watt or less. "To establish inherency, the [cited reference] 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted); MPEP §2163.07(a). Indeed, for a reference to implicitly disclose a particular technical feature, the feature must be reasonably apparent to a person having ordinary skill. *See* MPEP §2144.01. Buckley fails to inherently teach or suggest a system structured to consume power at about one watt or less because the reference expressly teaches using a high constant current of at least 7 amps. Therefore, Buckley cannot serve as the basis for a *prima facie* case of obviousness of the present claims.

Kelley also fails to disclose, teach or otherwise suggest this feature. Kelley discloses a pipe cell that uses a 3-12 volt power supply (Kelley, column 2, lines 65-66; column 5, line 63). In each of the Examples shown in Kelley, the power consumed would be significantly greater than one watt.

Kelley (US-6,306,281) - Electrolysis Cell Properties				
Example	Voltage (volts)	Current (amps)	Resistance (ohms)	Power (watts)
c.4:ll.60	6	6.4	0.94	38.4
c.5:ll.11-12	6	3.2 - 3.3	1.88 - 1.82	19.2 - 19.8

[*continued on next page*]

[1] This calculation is for power consumed by the electrolysis cell alone and ignores power consumed by any other system components, which would in fact require additional power input to the Buckley system.

[*continued from previous page*]

Ex. 1	6	5	1.20	30.0
Ex. 2	6	4.8	1.25	28.8
Ex. 3	--	--	--	--
Ex. 4	6	4.3	1.39	25.8
Ex. 5	6	2.9	2.07	17.4
Ex. 6	6	3	2.00	18.0
Ex. 7	6	2.6	2.31	15.6
Ex. 8	6	3	2.00	18.0
Ex. 9	6	3.2	1.88	19.2
Ex. 10	--	--	--	--
Ex. 11	--	--	--	--
Ex. 12	--	--	--	--
Ex. 13	6	4.5	1.33	27.0
Ex. 14	--	--	--	--
Ex. 15	12	20	0.6	240
Ex. 16	12	9	1.33	108
Ex. 17	12	7	1.71	84

In direct contrast, Table A of the Subject Application, previously incorporated by reference, lists the power consumption of the claimed system at about one watt or less. The Office asserts that Kelley in view of Buckley is structurally the same as the claimed system, and therefore, one of ordinary skill in the art would have allegedly found it obvious that the system disclosed in Kelley in view of Buckley is inherently capable of consuming power at about one watt or less. Furthermore, the Office asserts that "Kelley is inherently capable of producing a current such that the voltage going through the electrolysis cell is 1 watt or less."[2] However, these assertions are incorrect because they clearly ignore the entirety of the technical disclosure in the reference.[3]

[2] Applicant assumes the Office intended to state that the cell consumes power of 1 watt or less because voltage cannot go through anything; a voltage is applied across a load. It is current (i.e., charge flow) which flows through a load. Generally, the product of the voltage across a load and the current through a load is the power consumed by the load.

[3] A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. MPEP §2141.02(VI); *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

Kelley discloses a power consumption of 15.6 watts or greater. The power consumed by the cell disclosed in Kelley is a function of the applied voltage across, and the induced current through, the electrolysis cell. A person having ordinary skill understands that when a voltage is applied across a cell, the current induced through the cell is a function of the cell's resistance/impedance, which is in turn a function, at least in part, of the characteristics of the electrodes, electrolyte(s), membranes, and the other components of the cell. Accordingly, a person having skill in the art would readily understand that any given electrolysis system is not inherently capable of functioning under any set of conditions, but rather the properties of the cell, such as its power consumption, are based, at least in part, on the structure and materials of the cell and the composition of the electrolyte solution(s). Thus, a person having skill in the art cannot simply adjust the voltage applied to the cell disclosed in Kelley in order to only consume 1 watt of power. A person having skill in the art would certainly understand that it would require substantial reconfiguration and experimentation to modify the cell disclosed in Kelley to consume power at about 1 watt or less. This is not an obvious modification; and indeed, it would require inventive steps.

As stated above, all of the Examples in Kelley disclose cell properties (e.g., applied voltage, induced current, and resulting power consumption) that are specific for the disclosed pipe cell. The conditions present, particularly the concentration of salts present between the anode and the cathode, are indicative of a high consumption of power and thus a relatively high wattage requirement. This is evidenced by the high power values determined from the product of the voltages and currents disclosed in Kelley. The other cited references similarly do not disclose, teach, or otherwise suggest the relatively low power consumption made possible by the claimed system.

B. Independent claims 9 and 15.

Claims 9 and 15 provide that the anode and the cathode are separated by a non-conducting porous flow barrier structured and arranged to restrict flow of the aqueous feed solution through the cell chamber and thereby increase a proportion of aqueous halogen dioxide feed solution that flows through the anode. The Office asserts that this feature is taught by

Kaczur. However, Applicant respectfully submits that Kaczur fails to teach or suggest this claim feature, among others.

Kaczur discloses that "[a] thin protective spacer such as a chemically resistant plastic mesh can be placed between the membrane and the anode surface to provide for use of expanded metal anodes when using a liquid anolyte in the anode compartment. A spacer can also be used between the cathode and cation exchange [membrane] separating the ion exchange compartment from the cathode compartment [sic]." In addition, "separators and spacers may be used between the cation exchange membranes and the electrodes to provide a gas release zone." (Kaczur, column 8, lines 6-13 and 28-30). Example 9 in Kaczur discloses three layers of polypropylene spacer material with 1/8" square holes used to distribute the feed in the ion exchange compartment and physically support the ion exchange membranes (Kaczur, column 10, lines 56-59).

A "thin protective spacer" such as a mesh positioned between electrodes and ion-exchange membranes does not teach or suggest a porous flow barrier positioned between the anode and cathode as presently claimed. One of ordinary skill would readily recognize that the spacers and separators disclosed in Kaczur function simply to ensure that the anode and/or cathode does not come into direct physical contact with the respective cation exchange membranes; especially with expanded electrodes, which may short circuit the anode and/or cathode compartment. The spacers and separators may also disengage oxygen gas from the anode compartment and hydrogen gas from the cathode compartment as these gases form in solution due to the segregated redox reactions occurring in each respective compartment (Kaczur, column 4, lines 9-15 and at column 10, lines 49-51). However, these teachings do not suggest the use of a porous flow barrier to restrict the flow of solution through a cell chamber as presently claimed.

The Office also notes that Kaczur discloses three layers of polypropylene spacer material with 1/8 inch square holes used to distribute the feed in the ion exchange compartment and physically support the ion exchange membranes. Similarly, these teachings also fail to teach or suggest the porous flow barrier as presently claimed. Specifically, Kaczur provides:

> The central ion exchange compartment consisted of a 1/8" (0.318 cm.) thick compartment with inlet and outlet ports with a series of drilled holes to evenly distribute the aqueous chlorite feed flow in the compartment. Three layers of a polypropylene spacer material with 1/8" square holes (1/8" thickness total) was used to distribute the aqueous chlorite feed in the compartment and to physically support the cation exchange membranes. (Kaczur, column 10, lines 52-59).

The spacer material is described as distributing chlorite feed flow to the central ion exchange compartment. Thus, the spacer material in Kaczur assists feed flow through the ion exchange compartment. In contrast, the porous flow barrier as presently claimed restricts the flow of an aqueous feed solution through a cell chamber. One of ordinary skill in the art would not reasonably interpret a structure intended to facilitate flow distribution through an ion exchange compartment as teaching or suggesting a flow barrier to increase a proportion of solution that flows through an anode as presently claimed. Thus, contrary to the Office's assertion, Kaczur does not teach and can not reasonably suggest this claim feature, among others.

The Office further asserts that the separators disclosed in Kaczur would be structurally the same as the claimed porous flow barrier if the Kaczue separators were incorporated into the cells disclosed in Buckley or Kelley. However, this assertion is simply factually inaccurate. A layer of spacer material having 1/8 inch holes therethrough is not the same structure as a porous flow barrier as described in the Subject Application.[4] Assuming, *arguendo*, that the cells disclosed in Buckley or Kelley were modified to incorporate a porous anode and a thin protective spacer as disclosed in Kaczur, the resulting structure would not function to increase a proportion of aqueous feed solution that flows through the anode. There is no reasonable interpretation in which a layer of polypropylene spacer material that functions to facilitate flow through, and support membranes in, an electrolysis cell does not read on a porous flow barrier structured to increase the pressure drop across a non-membrane electrolysis cell.

Applicant respectfully submits that one of ordinary skill in the art would have no reason to combine and modify the teachings of Buckley, Kelley, and/or Kaczur because to do so

[4] See the specification on page 13, lines 3-32, and Figures 6 and 8, describing the structure of a porous flow barrier as used in the embodiments disclosed in the Subject Application.

would require substantial reconstruction and redesign of the arrangement, structure, operation and function of the components disclosed in the cited references. A reconfiguration of this magnitude would involve more than the mere application of ordinary skill and would involve inventive steps. Thus, the cited references are not sufficient to render the present claims *prima facie* obvious.

As described above, none of the features of the present claims discussed above are taught or suggested in the cited references or in the knowledge and understanding generally available in the art. One of ordinary skill would have no reason to combine and modify the teachings of Buckley, Kelley, Kaczur, and the other cited references in order to arrive at the present claims unless they were using the Subject Application as a guide. In the Subject Application, the differences between the present claims and the prior art teachings are substantial, and the understanding of one of ordinary skill does not remedy the considerable differences. Thus, the present claims are not obvious and represent an inventive step over the prior art.

C. Dependent claims.

Independent claims 1, 9 and 15 are non-obvious. If an independent claim is non-obvious under 35 U.S.C. §103(a), then any claim depending therefrom is non-obvious. *See* MPEP 2143.03. Thus, claims 1-19 are all non-obvious. Therefore, Applicant respectfully requests withdrawal of the rejection of claims 1-19 under 35 U.S.C. § 103(a), and allowance of the claims.

VII. Conclusion:

Applicant requests that the present rejections be withdrawn. Applicant submits that claims 1-19 of the present invention recite systems and devices that are both novel and non-obvious. Applicant respectfully submits that the present application is in condition for allowance. Accordingly, in view of the foregoing, allowance of the claims at an early date is

respectfully requested.

If the undersigned can be of assistance to the Office in addressing issues to advance the application to allowance, please contact the undersigned at the number set forth below.

Respectfully submitted,

8-Dec-08
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